METHODS OF DISINFECTION RECOMMENDED BY THE DEPARTMENT OF HEALTH OF THE CITY OF NEW YORK

DISINFECTION AND DISINFECTANTS

SUNLIGHT, pure air, and cleanliness are always very important agents in maintaining health and in protecting the body against many forms of illness. When, however, it becomes necessary to guard against such special dangers as accumulated filth or contagious diseases, disinfection is also essential. In order that disinfection shall afford complete protection, it must be thorough, and perfect cleanliness is better, even in the presence of contagious disease, than poor disinfection.

All forms of fermentation, decomposition, and putrefaction, as well as the infectious and contagious diseases, are caused by minute living germs. The object of disinfection is to kill these germs. Decomposition and putrefaction should at times be prevented by the immediate destruction or removal from the neighborhood of the dwelling of all useless putrescible substances. Impure air, especially air from sewers, cesspools, putrefactive matter, etc., causes conditions in man which are very favorable to the contraction of contagious diseases.

In order that the sick-room shall be readily kept clean and as free as possible from the germs causing the infectious diseases, it is important that all articles not necessary for immediate use in the care of the sick person, especially upholstered furniture, carpets, curtains, and bric-a-brac, should be removed from the room to be occupied by the sick person. If another room has already been occupied, it must be disinfected.

AGENTS FOR CLEANSING AND DISINFECTION

Too much emphasis cannot be placed upon the importance of sunlight, fresh air, and cleanliness, both as regards the person, the dwelling, and its surroundings, in preserving health and protecting the body from all kinds of disease. Sunlight and fresh air should be freely admitted through open windows, and personal cleanliness should be attained by frequently washing the hands and body.

Cleanliness in dwellings and other places may, under ordinary circumstances, be maintained by the use of the three following solutions:

1. SOAPSUDS SOLUTION.—For simple cleansing, or for cleansing before or after the methods of disinfection by chemicals described below, one ounce of common washing soda should be added to twelve quarts of hot soap (soft soap) and water.

2. STRONG SODA SOLUTION.—This, which is a stronger and more effective cleansing solution, is made by dissolving one-half pound of

common washing soda in three gallons of hot water. The solution thus obtained should be applied by scrubbing with a hard brush.

3. WEAK SODA SOLUTION.—This is made by dissolving one ounce of common washing-soda in twelve quarts of hot water.

When it becomes necessary to arrest putrefaction or to prevent the spread of contagious diseases by killing the living germs which cause them, more powerful agents must be employed than those required for simple cleanliness, and these are called disinfectants. The following are some of the most reliable disinfectants:

4. HEAT.—Complete destruction by fire is the best method of disposing of infected articles of small value; but continued high temperatures not as great as that of fire will destroy all forms of life. Thus, boiling or steaming in closed vessels for one-half hour, or boiling in the weak soda solution in open vessels for the same time, will destroy all disease germs. Dry heat is not so effective a germ destroyer as moist heat, except at much higher temperatures, which will destroy or injure many combustible materials.

5. CARBOLIC ACID SOLUTION—LYSOL-CREOLIN.—Dissolve six ounces of carbolic acid in one gallon of hot water. This makes approximately a five per cent. solution of carbolic acid, which for many purposes may be diluted with an equal quantity of water. Great care must be taken that the pure acid does not come in contact with the skin, as it is very corrosive. The commercial colored impure carbolic acid should not be used in watery solutions, as it contains a large percentage of cresol, which is insoluble in water and has therefore little value. The two alkaline solutions of cresol, named lysol and creolin, are strong disinfectants and non-corrosive, and can be used in place of the solutions of carbolic acid of equal strength.

6. BICHLORIDE SOLUTION (*bichloride of mercury or corrosive sublimate*).—Dissolve sixty grains of pulverized corrosive sublimate and two tablespoonfuls of common salt in one gallon of hot water. This makes approximately a 1 to 1000 solution. This solution must be kept in glass, earthen, or wooden vessels (not in metal vessels), and is not to be used for disinfecting metal articles.

The carbolic and bichloride solutions are very poisonous when taken by the mouth, but are harmless when used externally.*

* The cost of the carbolic solution is much greater than that of the other solutions, but generally this solution is to be much preferred. When the cost is an important element, the bichloride solution may be substituted for all purposes for which the carbolic solution is recommended, except for the disinfection of discharges, eating utensils, and articles made of metal, and of clothing, bedding, etc., which is very much soiled. Its poisonous character must be kept constantly in mind.

7. Milk of Lime.—This mixture is made by adding one quart of dry freshly slaked lime to four or five quarts of water. (Lime is slaked by pouring a small quantity of water on a lump of quick-lime. The lime becomes hot, crumbles, and as the slaking is completed a white powder results. The powder is used to make milk of lime.) Air-slaked lime has no value as a disinfectant.

8. Dry Chloride of Lime.—This must be fresh and must be kept in closed vessels or packages. It should have the strong pungent odor of chlorine.

Chlorinated Lime Solution.—This solution is made by adding six ounces of fresh chloride of lime, having a strong odor of chlorine, to one gallon of water. It must be well mixed and should be prepared one hour before using. This solution, when fresh, is a reliable disinfectant and deodorizer.

9. Formalin.—This is a forty per cent. solution of formaldehyde gas in water. It is, in a five per cent. solution, an efficient disinfectant and deodorizer. A method which gives fairly efficient results is to hang large cloths (sheets) in the room and sprinkle or spray them with formalin, as recommended by the Chicago Health Department. For each one thousand cubic feet of space in the room ten ounces of formalin should be used.

10. Sulphurous Acid Gas (the gas produced by burning sulphur) is a fairly efficient germicide under certain definite conditions. These conditions are, in brief, that all the germs should be freely exposed to the gas in a tightly closed room for at least eight hours, that the air of the room should be moist, and that the amount of gas should be that generated by burning at least three pounds of sulphur for every one thousand cubic feet of air-space.

The proprietary disinfectants which are so often widely advertised, and whose composition is kept secret, are relatively expensive and often unreliable and inefficient. It is important to remember that substances which destroy or disguise bad odors are not necessarily disinfectants.

METHOD OF DISINFECTION IN INFECTIOUS AND CONTAGIOUS DISEASES

The most important diseases to be guarded against by disinfection are scarlet fever, measles, diphtheria, tuberculosis (consumption), smallpox, typhoid and typhus fever, yellow fever, and cholera.

1. Hands and Person.—Dilute the carbolic acid, lysol, or creolin solutions with an equal amount of water, or use the bichloride solution

without dilution. Hands soiled in caring for persons suffering from contagious diseases or soiled portions of the patient's body should be immediately washed with one of these solutions, and then thoroughly washed with soap and water. The nails should always be kept perfectly clean with a brush or nail-cleaner. Before eating the hands should be first washed in one of the above solutions, then thoroughly scrubbed with soap and water by means of a brush, and finally dipped again in the disinfectant.

2. SOILED CLOTHING, TOWELS, NAPKINS, BEDDING, etc., should be immediately immersed, in the sick-room, in boiling water for one half hour or in the carbolic solution for twelve hours. They can then be wrung out and washed in the usual way. Articles such as beds, woollen clothing, etc., which cannot be washed should be referred to the Health Department for disinfection or destruction.

3. FOOD AND DRINK.—Food thoroughly cooked and drinks that have been boiled are free from disease germs. Food and drinks, after cooking or boiling, if not immediately used, should be placed when cool in clean dishes or vessels and covered. In presence of an epidemic of cholera or typhoid fever, milk and water used for drinking, cooking, washing dishes, etc., should always be boiled before using, and when cholera is prevalent all persons should avoid eating uncooked fruit, fresh vegetables, and ice.

4. DISCHARGES OF ALL KINDS, FROM THE MOUTH, NOSE, BLADDER, AND BOWELS of patients suffering from contagious diseases should be received into glass or earthen vessels containing the carbolic solution or milk of lime, or they should be removed on pieces of cloth, which are immediately burnt or immersed in one of these solutions. Special care should be observed to disinfect at once the vomited matter and the intestinal discharges from cholera patients, as these alone contain the dangerous germs. In typhoid fever the intestinal discharges and urine, and in diphtheria, measles, and scarlet fever the discharges from the throat and nose, all bring about infection and should be treated in the same manner. The volume of the solution used to disinfect discharges should be, with the carbolic solution at least twice as great as that of the discharge, or with milk of lime from four to five times as great. After standing for an hour or more, the disinfecting solution, with the discharges, may be thrown into the water-closet. Cloths, towels, napkins, bedding, or clothing soiled by the discharges must be at once placed in the carbolic solution and the hands of the attendants disinfected as described above. In convalescence from measles and scarlet fever the scales from the skin (peeling) are also carriers of infection. To prevent

the dissemination of disease by means of these scales the skin should be carefully washed daily in warm soap and water. The external use of vaseline for the same purpose is recommended. After use the soapsuds should be thrown into the water-closet and the vessel rinsed out with carbolic solution.

The ordinary house filtration of water does not remove all the germs of disease and cannot be depended upon to render the water safe in time of danger.

The intestinal discharges (feces) need special treatment on account of the difficulty with which the disinfectant fluids penetrate to all portions. To thoroughly disinfect a mass of feces it is necessary to add to it double its amount of one of the strong disinfecting solutions and allow it to soak for twelve hours. If desired to hasten the process, the fecal matter covered by a carbolic acid or formalin solution can be thoroughly mixed with the disinfectant, allowed to stand for one hour, or thoroughly disinfected by boiling for thirty minutes.

5. The Sputum from Consumptive Patients.—The importance of the proper disinfection of the sputum (expectoration) from consumptive patients is little understood. Consumption is a contagious disease, and is always the result of transmission from the sick to the healthy or from animals to man. The sputum contains the germs which cause the disease, and in great majority of cases is the source of infection. After being discharged, unless properly disposed of, it may become dry and pulverized and float in the air as dust. This dust contains the germs and is the common cause of the disease through inhalation. In all cases therefore the sputum should be disinfected when discharged. It should be received into covered cups containing the carbolic, lysol, or formalin solutions. Handkerchiefs soiled by it should be burned, or soaked in the carbolic solution and then boiled. Dust from the walls, mouldings, pictures, etc., in rooms that have been occupied by consumptive patients contains the germs and will produce tuberculosis in animals when used for their inoculation. Therefore rooms should be thoroughly disinfected before they are again occupied. Rooms in which consumptives are living should never be dusted with a dry cloth or brush, but should always be cleansed by wiping furniture, mantels, etc., with a damp cloth. This cloth should afterwards be burnt or disinfected by soaking it in the carbolic or chlorinated lime solution or by boiling in the weak soda solution for half an hour. Carpets should be thoroughly swept with a broom wrapped in a damp cloth, the latter being afterwards disinfected as above. If the sputum of all consumptive patients were destroyed at once when discharged, a large proportion of the cases of the disease would be prevented.

6. CLOSETS, KITCHEN AND HALLWAY SINKS, ETC.—Each time the closet is used for infected discharges one pint of the carbolic solution should be poured into the pan (after it has been emptied) and allowed to remain there. All discharges should be disinfected carefully before being thrown into the closet. Sinks should be flushed at least once daily.

7. DISHES, KNIVES, FORKS, SPOONS, etc., used by a patient should be kept for his exclusive use and not removed from the room. They should be boiled or washed first in the carbolic solution, then in hot soap-suds, and finally rinsed in hot water. These washing fluids should afterwards be thrown into the water-closet. The remains of the patient's meals may be burned or thrown into a vessel containing one of the disinfectant solutions and allowed to stand for one hour before being thrown away.

8. ROOMS AND THEIR CONTENTS.—Rooms which have been occupied by persons suffering from contagious disease should not be again occupied until they have been thoroughly disinfected by the Health Department and renovated by the owner. For this purpose either careful fumigation with sulphur or formaldehyde gas will be employed, or one of these combined with the following procedure: Carpets, curtains, and upholstered furniture which have been soiled by discharges, or which have been exposed to infection in the room during the illness, will be removed for disinfection by steam. Woodwork, floors, and plain furniture will be thoroughly washed with the soapsuds and bichloride solutions.

Books, leather articles, and those which are readily discolored will be removed by the Department and disinfected by exposing them for twelve hours to formaldehyde vapor in a small chamber.

9. RAGS, CLOTHES, AND ARTICLES OF SMALL VALUE which have been soiled by discharges from the patient or infected in other ways should be burned.

10. IN CASE OF DEATH, the body should be completely wrapped in several thicknesses of cloth wrung out of the carbolic or bichloride solution and placed in an hermetically sealed coffin.

If notified, the Department of Health of New York City will disinfect rooms and their contents without cost to the tenant after the rooms have been vacated by persons convalescent from any contagious disease. Notification should be sent to the Chief Inspector of Contagious Diseases, Sixth Avenue and Fifty-fifth Street. Telephone Call, No. 1204 Columbus.

It is important to remember that an *abundance of fresh air, sunlight, and absolute cleanliness* not only helps protect the attendants from

infection, but also aids in the recovery of the sick. Sunlight is one of the most effective disinfectants known, killing all germs directly exposed to it within a few hours.

METHODS OF CLEANLINESS AND DISINFECTION TO PREVENT THE OCCURRENCE OF ILLNESS

1. WATER-CLOSET BOWLS AND ALL RECEPTACLES FOR HUMAN EXCREMENT should be kept perfectly clean by frequent flushing with a large quantity of water, and as often as necessary disinfected with the carbolic or chlorinated lime solutions. The woodwork around and beneath them should be frequently scrubbed with the hot soapsuds solution.

2. SINKS AND THE WOODWORK AROUND AND THE FLOOR BENEATH THEM should be frequently and thoroughly scrubbed with the hot soapsuds solution.

3. SCHOOL SINKS.—School sinks should be thoroughly flushed with a large quantity of water at least twice daily, and should be carefully cleaned twice a week or oftener by scrubbing. Several quarts of the carbolic or chlorinated lime solutions should be frequently thrown in the sink after it has been flushed.

4. CESSPOOLS AND PRIVY VAULTS.—An abundance of milk of lime, dry chloride of lime, or chlorinated lime solution (at least four times the amount of the excreta to be disinfected) should be thrown into these daily, and their contents should be frequently removed.

5. CELLARS AND ROOMS IN CELLARS are to be frequently whitewashed, and, if necessary, the floors sprinkled with fresh, dry chloride of lime. AREAS AND PAVED YARDS should be cleaned, scrubbed and, if necessary, washed with the bichloride solution. STREET GUTTERS AND DRAINS should be cleaned and when necessary sprinkled with chloride of lime or washed with milk of lime.

6. AIR-SHAFTS.—Air-shafts should be first cleaned thoroughly and then whitewashed. To prevent tenants throwing garbage down air-shafts, it is advisable to put wire netting outside of windows of apartments opening on shafts. Concrete or asphalt bottoms of shafts should be cleaned and washed with the bichloride solution, or sprinkled with chloride of lime.

7. HYDRANT SINKS, GARBAGE RECEPTACLES, AND GARBAGE AND OYSTER-SHELL SHUTES AND RECEPTACLES should be cleaned daily and sprinkled with dry chloride of lime.

8. REFRIGERATORS AND THE SURFACES AROUND AND BENEATH THEM, DUMB-WAITERS, etc., may be cleaned by scrubbing them with the hot soapsuds solution.

9. TRAPS.—All traps should be flushed daily with an abundance of

water. If at any time they become foul, they may be cleaned by pouring considerable quantities of the hot strong soda solution into them, followed by the carbolic solution.

10. URINALS AND THE FLOORS AROUND AND UNDERNEATH THEM should be cleaned twice daily with the hot soapsuds solution, and in addition to this, if offensive, they may be disinfected with the carbolic solution.

11. STABLE FLOORS AND MANURE VAULTS.—Stable floors should be kept clean and occasionally washed with hot soapsuds or the hot strong soda solution. Powdered fresh chloride of lime may be used in manure vaults.

12. VACANT ROOMS should be frequently aired.

13. THE WOODWORK IN SCHOOL-HOUSES should be scrubbed weekly with hot soapsuds. This refers to floors, doors, door-handles, and all woodwork touched by the scholars' hands.

14. SPITTOONS IN ALL PUBLIC PLACES should be emptied daily and washed with the hot weak soda or soapsuds solution, after which a small quantity of the carbolic solution or milk of lime should be put in the vessel to receive the expectoration.

15. ELEVATED AND SURFACE CARS, FERRY-BOATS, AND PUBLIC CONVEYANCES.—The floors, door-handles, railings, and all parts touched by the hands of passengers should be washed frequently with the hot weak soda or in the soapsuds solution. Slat-mats from cars, etc., should be carefully cleaned by scrubbing with a stiff brush in the hot soapsuds solution.

USE OF BROMINE SOLUTION AS A DEODORANT.

SLAUGHTER-HOUSES, BUTCHERS' ICE-BOXES AND WAGONS, TRENCHES, EXCAVATIONS, STABLE FLOORS, MANURE VAULTS, DEAD ANIMALS, OFFAL, OFFAL DOCKS, etc., may be deodorized by a weak solution of bromine, which is a valuable agent for this purpose. The bromine solution, however, is only temporary in its action and must be used repeatedly. It should be applied by sprinkling. Although somewhat corrosive in its action on metals, it is otherwise harmless.*

* The solution of bromine must be prepared with great care, as the pure bromine from which it is made is dangerous. It is very caustic when brought in contact with the skin; it is volatile and its fumes are extremely irritating if inhaled. In preparing this solution in large quantities, a pound bottle of bromine should be dropped into a barrel containing forty or fifty gallons of water and then broken under water with an iron bar. The solution is completed by thoroughly stirring. To prepare a smaller quantity an ounce bottle of bromine may be dropped into a pail containing three or four gallons of water and broken in the same way and with the same care.

CONCLUSION.

The general principles of disinfection outlined in this circular may be applied for the disinfection of all articles not specifically treated of, and which are similar in character to those considered.

By order of the Board of Health.

MICHAEL C. MURPHY,
President.

C. GOLDERMAN,
Secretary *pro tem.*

[The Board of Health of New York City requires that all infectious and contagious cases shall be reported, and in the crowded districts these cases are to be visited, and a placard placed upon the door, warning visitors not to enter. After the disease is over the Health Officers come and fumigate if the family circumstances are such that they cannot do this themselves. They will also, on request, sterilize or destroy infected bedding. A list of the houses where contagious diseases are reported is prepared daily and sent to all schools, day nurseries, and similar places, or to any one wishing it. A leaflet is also printed in English, Italian, German, or Yiddish giving in very simple language careful information as to the cause and propagation of phthisis, with instructions for disinfection.]

MUNICIPAL DISINFECTION IN BERLIN

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THE Berlin city ordinances compel disinfection of rooms after they have been occupied by persons suffering from Asiatic cholera, small-pox, diphtheria, typhus, and cerebro-spinal meningitis.

After typhoid, scarlet fever, epidemic dysentery, measles, whooping-cough, and pulmonary tuberculosis disinfection is always advised, but is only compulsory (ordered and supervised by the police department) in certain cases or under certain conditions.

The disinfecting plant occupies a large T-shaped building, so planned and divided that the infected articles are brought in at one court-yard and taken out through another, no disinfected article ever being carried through room or yard through which infected articles must pass. The city authorities send men to disinfect dwelling-rooms; they are fumigated with formalin and ammonia for three and a half hours. Pictures and furniture are washed off with five per cent. carbolic acid solution.